SOME CORRELATES OF SUPERIOR ACADEMIC ABILITY

A thesis submitted to the University
of New Zealand in partial fulfilment
of the requirements for the degree of

MASTER OF ARTS
in Psychology

by

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1959

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1 OUTLINE OF RESEARCH

In very general terms the problem is to distinguish some factors associated with intellectual ability. The correlates sought were not thought to exist in any particular region but were sought merely as correlates 'per se'. This might be alternatively expressed by saying that this research was not started with any particular theory in mind. To qualify this last statement although no explicitly formulated theory was delineated it was presumed that both the background and the present qualities of a person join to form the likli-hood of a person succeeding at any given task. A third factor, in addition to these two, enters into the problem. The third factor is the situation itself. In this case it was the university situation which for present purposes is fixed. Not only is the situation fixed at present but

also is objectively the same for all students, whether sub-or-super-average. No doubt the subjective aspects are of direct relevance in many situations but in the interests of simplicity they lie outside the main scope of this study.

We confine ourselves then to those aspects other than the situation. Firstly there can be a section of personal history or back-ground in which main results are tabulated under a series of standard headings. These items can then be subjected to some simple non-parametric statistical technique. By this method one can make a reasonably objective account of the significant items. Regrettably this approach is little used yet it seems to yield the most prolific results for the effort involved. For us this is the main area of interest.

Secondly there is the concern with present qualities. In both practice and utility the most fruitful way of approaching this aspect of the problem seems to be through testing. Perhaps the crudest and consequently most acceptable dichotomy we could formulate would be that of cognitive Vs personality aspects. Bearing in mind William James' famous dictum on fusion we might fruitfully try to assess the potency of each of these respective categories.

By use of the outline above we may find certain factors to be related to academic ability but at the stage of this research they are better expressed as correlates only and little attempt will be made to arrive at the causative factors which mediate these correlates, should any be found to exist.

2 STATEMENT OF THE PROBLEM

The problem of student selection is part of a more general problem in psychology, that of developing a predictive diagnostic instrument. One might, perhaps, fruitfully differentiate between two methods of approach. In one, one outlines the qualities that appear to be indispensable in student success, in the other one proceeds as do actuarial concerns (e.g. insurance companies) and extrapolate from previous history in order to make a probabilistic prediction. If one were able to unite the two approaches the result would, no doubt, be admirable, but at our present state of knowledge this seems not possible. This present study inclines more to the latter method of finding correlates of academic ability and attempting to differentiate on the basis of background items. Little attempt is made to evidence the necessary qualities.

The problem is then, how to develop a psychological diagnostic instrument that will predict success at the university without the necessity of waiting to see if the

student is successful or not.

Of the many students who enrol, for the first time, at university each year a few will become complete failures, a few outstanding successes and the majority, almost by definition, average. It seems reasonable to encourage most, those students who are most likely to succeed in a university career but in the early part of their university life it is difficult to distinguish them from the rest of the student population.

This study proceeded on the assumption that there are probably items in a student's background that have prognostic value for university success. One might consider there to be two methods of approach to the problem of prognosis by signs (it may be seen that this is an alternative way of dealing with the argument presented above). Firstly there is the point of view that any sign which predicts is, ipso facto, an explanation, for explanation implies prediction. Secondly there is the view that although one may have a diagnostic sign this sign may be mediated by another factor which is, itself, the important one. To ignore this unmentioned mediating factor is to fail to explain. Although the present writer inclines to the latter view, the former view is stressed in this study because it is in the nature of a new approach.

In summary then, the problem is to determine whether there are any indicators of university success, other than examination results, which may be used in the early stages to predict the type of university career a person is likely to have. Tests are a useful adjunct but

in this study the emphasis is upon the background of the student.

3 REVIEW OF LITERATURE

Prediction of ability, as Titchener said of psychology, has a long past and a short history. The long past goes back at least to Plato's Republic; the short history begins with the study of the new scientific methods, starting, perhaps, with Galton.

It is the 'short history' that is the major concern in this study, consonant with this it will be noted that the first psychological publication quoted is that of Galton.

Very roughly, the grouping in this review is a summary account of the British studies followed by one of the American studies. A rough approximation has been made to the chronology of publications but this has been waived in cases where greater continuity may be introduced by grouping certain studies together.

British Studies

The early history of John Stuart Mill provides

an excellent example of the influence which it is possible for the parent to exert over the child. While the value of the ultimate effect may be questionable it is certain that the foundation for J.S. Mill's later development were laid out by his father when the child was at a most impressionable age. It is of course impossible to say along what lines J.S. Mill would have developed had he been subjected to a less rigorous teacher, but it does seem he felt a loyalty to his father's premisses that later prevented him from realising a wider and more consistent philosophy. Alas, in view of the fact that at the age of twenty, he had what appears to have been a nervous breakdown. It is again possible that the intellectual acceleration was made at the expense of personality factors. In considering this parental influence the potential character of the child must be considered as well. J.S. Mill thought that any-one with same environment as he had could have done as well; but this is to discount all the individual differences of original nature. Catherine Cox has indicated that his I.Q. was in the region of 200. If this is a correct estimate then the modification of development caused by his early training does not seem of much importance. (25) (7)

In 1859 Charles Darwin propounded the theory of evolution and natural selection. As an application of these ideas, his cousin Galton wrote "Hereditary Genius" ten years later. This was the pioneer study of the antecedents of intellectual superiority. Galton's aim was to study genius genetically through evolution, mathemetics, anthropology and eugenics. His results

showed that in general distinguished men are more likely to have distinguished sons than is the average individual.

Following on from this in 1874 Galton examined, with broader purpose than in his previous book, the backgrounds of 180 of the most distinguished scientists in Great Britain. Information was collected by means of a circular sent to each individual. It was in the form of a questionnaire, and covered such topics as parentage, extent of religious persecution endured, originality or eccentricity of character, and the measurement of the circumference of the head. The main emphasis was on the double question, "Can you trace the origin of your interest in science in general, and in your particular branch of it? How far do your scientific traits appear to have been innate?" This latter question is cast in a form that partially suggests an answer. There seems to be an obvious bias.

Some factors tend to be under emphasised, such as a favourable economic start, and man's potential modifiability. It is still impossible to estimate the amount of talent which lies dormant through want of an economic or other stimulus.

The results of questioning this group of scientists led Galton to state this conclusion; ".. my returns show that men of science are not made by much teaching, but rather by awakening their interests, encouraging their pursuits when at home, and leaving them to teach themselves continuously throughout life. Much teaching fills a youth with knowledge, but tends prematurely to satiate his appetite for more." (10) (11)

Next follow the reports of two studies closer to home. At the University of Melbourne, Hohne is doing a continuous series of experiments on students, using the ACER test. He has reached the original conclusion that vigorous selection of students based upon refined techniques will have no significant effect upon the failure rate unless there are at the same time fundamental changes in the policy and practices of examiners. (16)

In 1955 P.S. Burnham carried out a study at Canterbury University College, in which the Adult Test B40 ACER and the Scholastic Aptitude Test were used. The experimental group was composed as follows;

1. Art Students, N 62.
2. Commerce Students, N 35.
3. Engineering Students, N 28.
4. Science Students, N 30.

The results showed that with each of these groups School Certificate correlated consistently higher with Stage 1 than did post primary average fifth and sixth form classes. The relationship was substantially higher in the cases of Engineering and Science than with Arts and Commerce.

Compared with U.S. students, the Canterbury part-time students' average was consistently lower. Nearly one third of the experimental group were part-time students.

On a group of forty-eight sixth form boys, three of a bettery of seven Educational Aptitude Tests showed four different profile patterns. Burnham recommends a choice from a variety of signs, for example a person intending to do an arts degree should have a reasonably

high tested verbal reasoning ability. (4)

Some of the work of P.E. Vernon is concerned with the eleven plus selection in Britain. In a recent study (32) Vernon makes the general points of criticism against the use of the Intelligence Quotient; that is, its failure to differentiate between innate and acquired ability, and its lack of theory. What is more important, he indicates that a greater degree of liaison between psychologists and the lay public is required.

With all its faults, however, the use of tests is superior to the older methods in that it takes the exact age of the child into account, and is more completely standardised, particularly in the marking. For the borderline cases it seems that the use of essays might be an advantage.

The consideration of primary school marks is sometimes helpful. But this system may suffer from the defects that it not only puts a strain on the teacher, but also allows for more personal and moral bias. Perhaps even more important, it gives only a relative assessment within the school and therefore cannot be used for comparison with other schools.

In borderline cases other tests may be used; for example, spatial, mechanical, interest and personality tests, and the inter-view and oral examination.

Vernon concludes that the eleven plus leaves much to be desired, but he favours evolutionary rather than revolutionary change. As the system exists, selection should be done by persons with adequate psychological training, and it should be acknowledged that precise classifica-

tion is impossible. (32)

Moving to the higher stages of education we consider the study of Elizabeth M. Gould and T.G. McComisky on the academic performance of Arts students at the University of Edinburgh. A group of students numbering 674 was studied in relation to the level of attainment shown in their University Entrance Scottish Higher Leaving Certificate. At each extreme of the range a definite relationship was found, but at the intermediate adjacent levels there appeared no point of statistically significant difference.

The conclusions of this experiment led to the suggestion that selection should be based on a broader basis than the Scottish Senior Leaving Certificate. (13)

In a study of non-intellectual correlates of success and failure among university students, J. Hopkins, N. Malleson, and I. Sarnoff compared two groups. The criterion of success was taken as graduation, with or without delay. The criterion of failure was having enrolled for a degree course and left without completing it. The study was carried out at London.

The results were as follows;

1. There was a preponderence of failures from public and private schools.
2. A significantly greater proportion of successful students had received grants.
3. A significant number of the failures were children of parents who had attended public or private schools.
4. A significant number of the failures' parents had "attended" university.
5. A significant number of the failures' fathers were

"top" business and professional men.

6. A significant number of the failures said that their study was interfered with by health reasons. This is a conventional excuse, so the authors state.

7. A significant number of the failures were forced by parental pressure in choosing their subjects. Conversely, the graduates, (control group) chose their subjects because of interest and aptitude.

8. The failures tended to make their career decisions earlier. (In consequence they were less likely to have a realistic and flexible approach to the matter.)

9. A significant number of the failures reported that they had less confidence in their choice of a career. (This is consistent with number eight.)

10. A significant number of the failures reported that they had little contact with the opposite sex. Similarly, fewer of the failed students married or were engaged while they were at the University.

No significant difference was shown with Age, Religion, Number of siblings, Residence or extra curricula activities.

This study is the one most like that undertaken in the present thesis. The student is considered not as an abstract entity, but in his background of social and hereditary environment. That factors other than the sheer ability to pass examinations have an influence on the career of the student is here shown to be an important, if often overlooked, consideration in studying university success. (17)

Of more relevance to N.Z. conditions is G.W. Parkyn's recent study. In Volume 1 of "Success and Failure at the University", Parkyn deals with academic performance

and the entrance standard. The report is almost entirely statistical. Mr. Parkyn's intention in setting out the evidence in such detail is to enable others to draw their own conclusions, as he points out that the person chiefly responsible for carrying through an intensive research is in many ways less well fitted than other people to interpret the findings accurately.

The report is based on the performance of 4000 intramural students taking Stage 1 units during 1955. A sub-division is made of those students in their first year, and those in advanced years.

It is apparent from the results that the students in Stage 1 classes displayed a considerable range of scholastic and intellectual ability on entering the University, and that their performance at the University also showed a considerable range both in the number of units passed and in the quality of the work done. Success and failure came from all over the range of ability, attainment and qualification, though success did not come in equal proportions from every part of the range.

The low correlations may be accounted for by low validity, low reliability and a restriction of the range due to the highly selected nature of the sample. When a small range is maintained it is much easier to change the order.

The data presented may be expected to provide answers to three general questions. Is the entrance standard too low? Would raising the entrance standard help? Would an improvement in post primary education bring about an improvement in the performance of university students?

In considering the entrance standard, it is pointed

out that the majority of students, both full and part time, have the requisite ability for success. Success and failure came from all types of entrance, though University Scholarship students tend to do better and those on provisional matriculation worse, but not significantly so. Other factors must be taken into account, such as the difference in loads, aptitude, and study habits. Prior attainment accounts for about one third of the variance and is the biggest single factor. In the case of part-time students circumstantial factors operate over the whole range and seem to be important. If the minimum load is changed then different patterns emerge.

The next question considered is how far it would be possible to reduce the rate of failure by raising the entrance qualification. The difficulty here is in making an accurate discrimination at the borderline. The conclusion drawn is that to improve through selection would be very wasteful under present knowledge of the circumstances.

As far as improving performance through better schooling is concerned, it is considered that this would help a lot, but practical considerations render it impossible. In any case, a general improvement at the school leaving level would most likely have the effect of raising the standards required by the university. Specific failure within the group of entrants can therefore be expected to continue, unless the main causative factors, which appear to be largely independent of scholastic ability, can be identified and controlled.

In conclusion, it is stated that the best method would seem to be either to select the best or to train the worst entrants. In the majority of cases, failure appears

to be brought about not by too low a standard of entrance, but rather by factors that hinder performance throughout the greater part of the range of ability displayed by the students of Stage 1 classes.

It seems that a large proportion of actual failure is unnecessary, being neither inherent nor irrevocably predetermined by the level of ability and attainment reached by the successful students before they entered the university. The problem appears to be to discover what factors operate at the university level to prevent so many students from achieving what seems reasonable enough to expect of them. These factors are not found in the previous schooling of the students, nor in the methods of entrance to the university, but rather in the lives and circumstances of the students during the university years themselves.

There appear to be two main kinds of factors. The first has to do with conditions of study, the most important difference being that between full-time and part-time students. Also relevant here is the lack of an upper-sixth form year, which may be damaging, particularly to the part-time student. The second kind of influence is the period in the late teens through which the student is most likely to be passing, and which is one of adjustment to many changes. These may play havoc with any prediction of success and failure made previously.

The most important causes of failure, it would seem, are to be found in the day-to-day life and work of the students themselves. Here the most effective action can be taken to improve the academic performance of the student. (21)

United States I. Earlier Works

In 1922, working with a large financial grant, L.M. Terman outlined the procedures for the study of 1000 gifted children. In opposition to Galton, he did not limit his field to the socially successful. But he did, with Galton, decry the "environment hypothesis". Although conceding that there were advantages in the cultural environment of the majority of his "gifted" subjects, Terman believed that the formal educational experiences to which they were open were quite ordinary.

Perhaps the greatest criticism of Terman's study is that his criterion of a gifted child is in terms of the intelligent quotient.

In the summary of the first volume of his study, Terman noted the limitations of testing, and added that in most cases the precocity of the child was manifest in such signs as the wealth of miscellaneous information and a desire to learn to read. Terman did not accept eminence as a criterion of genius, since it is frequently a product of fortuitous circumstances. (29)

A few years after Terman began this study, a former pupil of his, Catherine Cox, carried out an examination of the early mental traits of 300 geniuses. In the editorial preface to this second volume, Terman mentions that there is no compulsion on genius; it must be brought to fruition.

Catherine Cox studied the existing biographical data concerning the childhood experiences and achievements of men of acknowledged genius, such as Mozart, Leibniz and Bacon. To the present writer this seems a curious approach in view of the previous statement that eminence is

not a criterion of genius. Various categories were made, such as the age of first reading and writing, when questions were first asked, and at what stage the child learned to master concepts. This gave rise to the devising of a test which has been used with some success and is included in this study. On the basis of information collected in this way, judgements were made as to how far in advance of their age mates these children were. Approximate mental ages and intelligence quotients were calculated for each genius. J.S. Mill, for example was estimated at about 200 I.Q.

Three main conclusions were drawn.

1. Youths who achieve eminence have, in general, (a) a hereditary above average and (b) superior advantages in early environment.

2. Youths who achieve eminence are distinguished in childhood by behaviour which indicates an unusually high I.Q.

3. That all equally intelligent children do not as adults achieve equal eminence is in part accounted for by our last conclusion: Youths who achieve eminence are characterised not only by high intellectual traits, but also by persistence of motive and effort, confidence in their abilities, and great strength in force of character. (7)

Four years after Catherine Cox, Barbara Burke presented the third volume in the series in a follow-up study of Terman's original group. By this time the majority of the subjects were either in high school or college.

One of the major findings at this stage was that about one third of the boys and nearly half the girls (with slight variations with age) reported that "Their lives had

been greatly influenced by a single person, book, philosophy or religion." The type of influence mentioned most frequently was that of one or both parents.

This study also contributed the construction of standards for rating achievement, social adjustment and environmental conditions. On each of these counts a subject could be dichotomously classed as superior/inferior. Firstly, a child was superior if an impartial judge predicted that he or she would achieve a career of distinction. Secondly, a child was said to be socially adjusted if he had a number of desirable friends, was a leader among them, had a normal attitude to persons of the same or opposite sex, and who obeyed the social mores. Thirdly, the environmental conditions were taken as superior if there were incentives leading to a wholesome and productive life, if there was companionship with parents, and also if adequate finance were available.

The general conclusion was that the promise of early youth had been fulfilled. (3)

By 1947 the average age of the Stanford group was thirty-five years. Again the conclusion was that the early promise had been achieved. This group included significantly more successful people than did the population at large.

The authors, Terman and Oden, point out that high achievement is neither an absolute nor a universal condition of success. It is "relative both to the pervading patterns of culture and to the individual's personal philosophy of life." Fame cannot be classed as an index of ability.

The writers, however, took the view that the

standard to be used was biased towards achievement demanding the use of intelligence, and was concerned "with vocational accomplishment rather than with the attainment of personal happiness." Despite this, the experimental group was found to be above average in physical health, marital happiness, mental health and general adjustment. In this group, success was associated with "stability rather than instability, with the absence rather than the presence of disturbing conflicts - - - - - - in short, a well-balanced temperament with freedom from excessive frustration."

An attempt was also made to discriminate between those with an I.Q. of over 169 and the total group. The latter comparison proved less fruitful than the former. It seems that the relative failure of the second attempt was due to the arbitrary quantification of an ill defined quality. Of the first comparison the conclusion was drawn that the essential difference between the two groups appeared to be the drive to achieve an all-round adjustment.

In conclusion the authors state, "At any rate we have seen that intellect and achievement are far from perfectly correlated. Why this is so, what circumstances effect the fruition of human talent, are questions of such transcendental importance that they should be investigated by any method that promised the slightest reduction of our present ignorance. So little do we know about our available supply of potential genius, the environmental factors that favour or hinder its expression, the emotional compulsions that give it dynamic quality, or the personality distortions that make it dangerous." (30)

Following this line sociological factors in the

development of talent and genius were studied by R.E.L. Faris in a report published in 1936. He noted in children the significance of early experiences in prox-imity to "central points of opportunity and stimulating contact." Also taken into account was the value of travel, and "wide acquaintanceship with educated persons, wide knowledge of reading matter, and adequate habits of using reference methods."

In his conclusions Faris said, "the most significant factors are relatively obscure and subtle, operating in more private mental processes of the person, and not always closely correlated with the more obvious external environmental features usually considered as the principal factors in many statistical studies of intelligence."

"Also of importance is the organisation of the intellectual surroundings of the person. The child who lives in an organised and rationalised world may learn more easily because of his confidence that the world is mechanical and that answers to his questions can be found."

Faris was a confirmed environmentalist. He believed that it was unnecessary to assume any innate advantages. Of talented mental calculators, he said that theirs was no mysterious talent but the ordinary consequence of a definite and particular series of experiences. (8)

In a review of literature covering 1930 to 1937, D. Harris examined factors affecting college grades. A weakness in the majority of studies, made evident by the presentation, is that they contain too few statistics. Many groups of results are contradicted by other groups. High school prediction is advanced in some cases, intelli-

gence testing in others, both methods being useful ones.

Different places find different tests more reliable. In one study "the average college rank of former students coming with a similar record from the same high school" was an even better means of prediction. Combinations of tests seemed to be better, but still little agreement was reached.

Younger people tended to do better. Intelligence factors were rarely controlled, however, and where they were the differences were minimised. Women did better than men. Factors relating to family size and sibling position held by the subjects produced conflicting evidence. Smokers were found to have a disadvantage, this being even greater in the case of inhalers.

There were conflicting reports on general health. Colour blind subjects, of whom there were 9% (diagnosed by the Ishihara Test), were slightly above average intelligence, and slightly below in grades.

According to Wakeham, high schools which sent few students to university got better results than did those which were less selective. Jones, however, found this was not the case in his study. Those students who used a library tended to do better than those who did not know how to use one. (This is consistant with one of the significant items in the present thesis.) In regard to study habits, Uhnbrook stated that "The total pattern, or rhythm, of activities may be far more important than any single factor that may be isolated for study."

Harris reports one British study. At Melbourne University, it was found that holders of scholarships on school leaving examinations for secondary schools did

"definitely" superior work. No data was given on intelligence. Frequent tutor meetings and prizes and dinners for the outstanding seemed to raise grades. Moderate employment did not seem to effect grades, but excessive employment had a harmful effect.

The Seashore Music Test proved to be a useful predictor in its own field. In one study 100% of those in the lowest quartile on both musical talent and the test did unsatisfactory work in music. In the Thorndyke Intelligence Examination for high school grades two sub-tests, those of linguistic ability and mathematical ability, were better predictions of what they purported to predict than were the three other sub-tests in this group.

At Yale, prediction of grades was found to correlate highly for "verbal" (.62) and "quantitative" subjects. The two predictive formulae were based on weighted combinations of high school rank and appropriate entrance examination scores.

In conclusion this study suggests that failures are easier to predict than successes. "A lack is harder to remedy than the difficulty of an ability which may be merely neglected". It is suggested that factors influencing grades, in order of importance, are ability, effort, and circumstances. (14)

United States II School References.

A study of some factors related to achievement of intellectually superior eighth grade children was made by Rodger Bishton in 1957. By using factor analysis, he isolated sixteen orthogonal factors from data gained by administering the following; California Achievement Battery, Mental Health Analysis, Ohio Youth Survey Needs

Questionnaire and a General information sheet.

The subjects were ninety-nine eighth-grade boys and girls from junior high schools in and near Columbus, Ohio. The criterion of "superior" was that of an I.Q. of more than 120 tested within the last two years. The findings were as follows:

1. The group had mastered skills in the three R's approximately one to two years in advance of the norm.
2. The ratio of boys to girls was approximately the same.
3. The physical developement of the superior group exceeded normal expectation.
4. The occupation of the fathers was 24% professional, 33% business.
5. The average number in the family was 2.37.
6. The vocational goal chosen by the pupil had status equal to or greater than that of the father.
7. Gifted children were somewhat less interested in the more vigorous type of contact sport and more interested in intellectual and quiet studies.

The article provided an interesting approach and was excellent in its presentation. (1)

In his enquiry as to whether or not the brighter child should start school before he is five, B.R. McCandless cited evidence to support the thesis that very superior children benefit on all scores from any "affective and discreet" application of the techniques used in their education. Techniques were discussed and evaluated and recommendations were made for their use. If applied properly, it was stated that acceleration, segregation, enrichment and early school admission were to be positively recommended. (19)

A survey of the education of gifted children was

made in Chicago by R.J. Havighurst, et al. Here the authors stressed the problem of distinguishing more than one kind of talent. For example, there is intellectual talent, drawing and mechanical talent. In contrast with this, a general talent may also be distinguished. There has been no adequate test developed for this talent, nor for many of the individual talents. Indeed, there appears to be no universally accepted precise definition of what constitutes talent.

Of the inadequate techniques at our command, we can say that they vary on the one hand from the subjective, such as the teacher's assessment, to the more objective on the other hand. The latter are usually less popular, customarily comprising a test battery. The undergrowth of accretions of ideas frequently obscures the major issues.

Also it is rarely possible to distinguish between fully flowered talent and the entirely potential talent; and there are, of course, infinite gradations between. The claim made by the authors seems doubtful: "At the present time we are able pretty well to discover the primary mental abilities by using objective intelligence tests." This appears to suggest a unity and coherence which is, in fact, wanting. (15)

United States III University References.

The problem of occupational choice was studied by Ginsburg and others in 1950. The point is made that occupational choice is a "free" choice and has two aspects. Firstly, a career may be chosen for its positive rewards; or secondly, it may be reached by default, having eliminated the most unsuitable choices.

What is needed is a concise and quantified

explication for the various factors which operate in the selection of a career or occupation. At the same time, however, the irrational elements that often creep into choice must also be recognised. These considerations are of importance as well in the study of success and failure of university students undertaken in the present thesis. (12)

A psychological study of eminent physical scientists was undertaken by Anne Roe. In the matter of education, she stressed that emphasis was usually given to the early and careful appraisal of interests and abilities. This was followed by encouragement, with freedom and opportunity for the full developement of talents.

To quote, " .. the vital point is to give the student the opportunity to find things out for himself. It makes no difference if the fact is well known or not at this level, what is important is that the student does not learn it by rote but by discovery."

In this Anne Roe was speaking of the sciences, but it would seem apposite to apply this principle to teaching in general. (24)

In 1953 Anne Roe summarised the results of a series of studies of sixty-four eminent scientists. These were divided almost equally into biologists, physicists and social scientists. The data was comprised of life histories, discussions about their work, and the results of three tests. From the discussions it was found that these men had worked hard in achieving eminence, and that their efforts had " .. usually been directed quite specifically toward the solution of some immediate problem rather than to a long term goal of eminence." (23)

Consonant with this career aspect, America's resources of specialised talent was made the topic of a

study by Dael Wolfe in 1954. Here it was found that the determining factors which decide who goes on to college are dichotomous, consisting of those factors related to the school progress of the student, and those not essentially related. An illustration of the former would be mental ability, that of the latter, ethnic differences. It does seem, however, that the ethnic background of some groups is related to school progress, as for example, in Little Rock.

Wartime flexibility in occupations illustrated well the wide ability evidenced by the majority of experts. Persons often have more than one field of interest, and many would doubtless be able to cope equally well in a similar or neighbouring field of work.

One sub-heading in this book is curious. "Will there be too many college graduates?" This would suppose an attitude whereby the policy was to limit the number of graduates to the jobs available for them, instead of planning to use the intellectual capacity of the nation. The author concludes, however, that there cannot be too many graduates as long as they have the necessary ability.

On the whole, this work is concerned with material employment. (34)

In his enquiry concerning the nature and nurture of genius, S.L. Pressey discussed the total import of the environment, and stressed the importance of cultural factors in determining the extent to which superiority in certain fields is sought and achieved. For instance, the flourishing of musical genius in Mozart's day may be compared with the competence shown by modern athletic champions.

Pressey identified five factors which he regarded as important.

1. The early opportunity for the developement of an ability, and the encouragement of family and friends.
2. Early and continuing superior guidance and instruction.
3. The opportunity to practice and to extend an ability according to progress made.
4. Association with others of similar interests.
5. The stimulation of many and increasingly strong success experiences.

These influences acting concomitantly with the basic ability would foster superiority in whatever field the culture honoured. (22)

In our culture the stress seems to be on scientists and the gifted student as a future scientist was the topic of a study by Paul Brandwein, in which he was concerned with the high school background of capable science students. Three factors were stressed. Firstly, the genetic; secondly, the predisposing factor, (the psychological and activating factor); and thirdly, the factor referring to the extent and kinds of opportunities offered in high school, and to the special skills of the teacher.

Of more importance than tests in identifying superior science students, was the provision of opportunities for the students to identify themselves. This was done by leaving the students open to advantages whereby they could show their own skill and interest by developing their own research projects. These students possessed minimal amounts of genetic and predisposing factors.

Other factors strongly stressed by Brandwein were the importance of personal guidance and occupational

information; the abundance of latent scientific talent in boys and girls; and the value of early committment to science, as is common in music, for example.

Perhaps the central factor in the whole scheme was the quality of teaching, especially the fostering of true research attitudes in high school pupils by freeing them from the "cook-book" approach to scientific knowledge. (2)

United States IV General Considerations.

Personality trait patterns of college students were studied by Carl Sternberg. The method used was that of factor analysis from the "Kuder Preference Record", the "Allport-Vernon Study of Values", and the group "M.M.P.I.", yielding twenty-four scales in all. The population was 270 white college males. It was, however, a volunteer group comprising 80% of the parent population, and was not, therefore, a random selection.

Two questions were studied. Firstly, what are the patterns made by college students in three measures of personality; (a) an interest inventory, (b) a values test, and (c) an inventory of tendencies towards maladjustment? Secondly, are there any significant differences in personality patterns among students majoring in different fields.

Seven factors were extracted, six of which were bipolar. The only factor that has direct reference to the present writer's study is that of the psychopathic deviate scale on the M.M.P.I. This had a correlation of minus .338 with factor II; a correlation of plus .376 with factor IV; and a correlation of plus .377 with factor V, where factor II is the "go-getter versus passive aesthete", factor IV is the "driven extravert versus pure scientist",

factor V is preoccupation with health.

Sternberg gives illustrations of the personality patterns of college students, and affirms that there are significant differences in personality patterns among students majoring in different fields. Every major is distinguished from other majors by at least one factor significant at the .01 level. Areas are in general more easy to distinguish than are individual majors. This is particularly true of the "aesthetic" (English and music) as distinct from the "scientific", (chemistry and mathematics.) It is to be noted, however, that the data does not lend itself to individual prediction.

In this matter of tested differences the College Entrance Examination Board of Princeton, New Jersey, has experimented with the Scholastic Aptitude Test in an effort to diminish inter-school differences by setting up a standard device. The Test was used in conjunction with other indicators. As yet we do not have any well selected over-all evidence of the validity and reliability of this test though it is mentioned in some studies. (28)

A study on the success and perseverance of university students was carried out by D.W. Fullmer at the University of Denver, Colorado. The results showed that students who changed their objectives on occasion were more likely to persevere than were those who kept to the same goal, although such prediction was only actuarial. (9)

A.B. Truesdell and J.A. Bath made a comparison of the relative value of clinical versus actuarial methods in academic prediction. The opinions of nine judges were compared with the Discriminate Function predictions. This latter involved the use of five sub-tests, from which

grade point average was obtained.

Generally speaking, it was found that the two methods were about equal in value. In both approaches most importance was attached to the grade point average, which was assigned more weight than all the other variables combined. It was generally recognised that the method of selection by judges left much to be desired, both from the consideration of selecting adequately experienced judges, and in ascertaining that all the necessary information was put before them. This test shows that at least as adequate a judgement may be made by the use of purely objective methods. (31)

Using an analysis of variance technique, N. Weitz and H.J. Wilkinson studied the relation between certain non-intellectual factors and academic success at university. The following factors were investigated.

1. Whether or not the subject was an only child.
2. If one or both parents were deceased at the time the subject entered college.
3. If the parents were divorced at the time the subject entered college.
4. Whether the subject graduated from a private secondary school or
5. a military academy.

The results of this enquiry showed that graduates from a military academy, only children, and those who fulfilled at least two of the above conditions had inferior academic records. The loss of one or both parents by death or divorce had no effect. (33)

The case of only children is interesting. It contradicts the evidence of Small and Terman. In the

present study it was found to be not significant.

The unpublished doctor's thesis of J.J. Small concerns the formative influences in the psych-educational backgrounds of superior graduate students. The criterion of a superior graduate was taken as the acceptance of the subject for the degree of Ph.D. Thirty-six graduates were studied from twenty-seven different fields. The findings were as follows.

1. The average ages ranged from twenty-five to forty-six, the mean being over thirty, with a median of between twenty-nine and thirty.
2. Over three quarters of the group were married. The median age of marriage was twenty-three, which is approximately the same as the United States national average.
3. They tended to be first or only children. (This was statistically significant.)
4. For about half the group, one or both parents had attended university.
5. Teaching, farming and selling were the most common paternal activities, while the professional-managerial class was the largest single occupational group present.
6. About half the students reported a family environment favourable to the developement of cultural and intellectual pursuits.
7. About a quarter of the group, excluding those with favourable home environments, were strongly influenced by one or more teachers who were close personally, and who persuaded them to continue where otherwise they would not have done so.
8. Those students with a deep intrinsic interest in their

subject had usually had significant experiences while doing independent research of their own. About half the students were so motivated, and most of these were scientists.

9. A feeling of freedom in the early cultivation of interests was often found to be important and was characterised by the use of "constructive aids to learning", as well as the absence of coercion.
10. The education of the group had often failed to provide opportunities for, and assistance in, three major tasks; self appraisal, personal involvement in learning, and career guidance.
11. The subjects seemed well adjusted, but in comparison with some undergraduate groups they seemed to be socially withdrawn.

The two defects in this study seemed to be firstly, the ommission of the control group technique, and secondly, the absence of statistical work, though the raw data was amenable to such treatment. (27)

The question, "Do renewable scholarships produce higher grades?" was the topic of a study by S.G. Clarke, E.W. Wright and C.A. Parker. Two groups of scholarship winners were compared with two matched control groups. The conclusion arrived at was that renewable type scholarships produce significantly extra motivation to increase the effort put into study. This results in significantly higher grades. (5)

The relation between student load and achievement was examined by P.T. Hountras at the University of Michigan Graduate School. The work of foreign students was analysed and it was found that a heavy schedule was not

the main reason for academic difficulties. In fact, weaker students attempted and achieved fewer hours of work, especially during early terms of residence. (It would seem as though "weaker" is defined as those attempting and achieving less.) It is suggested by the present writer that there is an optimal load. This study by Hountras demonstrates one aspect of it. (18)

Appraisal

Certain points may be noticed about the literature reviewed here. To the present writer some of the more significant points seem to be as follows:

Many of the studies use tests either for criteria or to attempt to differentiate. Although the "testing" approach is entirely laudable in that it attempts to standardise procedures the value of the results so obtained make it doubtful if this is the most fruitful method of procedure, at least at our present state of knowledge.

Bearing in mind the respective sizes of the two countries, the United States seems to be more acutely aware of the problem of student selection, though much work is being done in Britain. It might, perhaps, be true to say that in Britain the dominant interest is in the eleven plus selection.

In both countries a variety of approaches are used, and rightly so at this stage. It is suggested, however, that future researchers might concentrate on the reasonably well authenticated points, or factors, which have been experimentally isolated. These factors could then be studied latitudinally and longitudinally. Such a procedure suggests, of course, a greater degree of central control than exists at present.

Consonant with this point it will be noted how few longitudinal studies there are. The only genuinely comprehensive longitudinal study is that of Terman and his associates. It is a regrettable defect that some institutions might care to correct, regrettable in that Terman's

study has afforded us the best validated, and most, information of any comparably sized study to date.

Of the methodological defects perhaps the most common is that of the ommission of a control group. The second most common defect seems to be the neglect of control on factors connected with the experimental variable, (ommitting, of course, those studies which utilise the analysis of variance technique) or the non-random selection of subjects.

Summarily, then: although there is a wide range and large amount of literature on the subject of academic superiority, the studies are dominantly latitudinal and relatively isolated.

4 DESIGN OF THE EXPERIMENT

The criterion for selection of an able student was, perhaps, one of the most difficult decisions to make. By alteration of the criterion one may produce a markedly different sample than that which would have been produced had the criterion remained unchanged. Because of the manifold difficulties which accrue from the adoption of a particular criterion it was thought best in this study to select one which had some degree of official recognition. For this reason, elegibility for a New Zealand Senior National Scholarship was chosen. In order to be eligible a student must have completed a degree within four years of commencement, have passed his stage three with an 'A' pass and had a good academic record. Although all students in the experimental (academically superior) group in this study were in such a category not all were offered a Senior National Scholarship, and not all the offered ones were accepted. The main reason for rejecting an offer was

that the students in question were accepting another in its stead, another with greater financial emolument.

The total number of students eligible was so small that all students available (those considered for the 1959 academic session) were sought for interview and testing. In this group of superior (experimental) students sixteen names were obtained and all sixteen were traced, consented to co-operate and full information obtained from them.

It may well be true that certain background factors, or test results, are true of superior students but it may also be true that these factors are found generally and so the factors found are non-differentiating. For this reason a control group was used. To compare a group of superior students with others leads one to make what seems an obvious choice; use a group of 'average' students for the control group. Unfortunately there is no generally accepted criterion of what an 'average' student is. To overcome this a random selection was taken from the official University rolls. The experimental group was composed of science and arts faculties only. Consistent with this the control included only those who were in the science or arts faculties; Knowing the proportion of each faculty in relation to the general population of students it was calculated that to produce a control group twenty four in number it would be necessary to select every sixty fifth student going through the rolls in alphabetical order. The data of those students selected was then examined and all who were not in science or arts were rejected. A control group of twenty two instead of the calculated twenty four was the result of this procedure. These twenty two students were

sought; one was untraceable and one declined to co-operate thus leaving the control group at twenty in number. All thirty six students were then interviewed and tested.

Interviewing

The interviewing time ranged from half an hour up to three hours, the length of time being determined by the S's willingness to talk. Generally speaking the interview was kept as unstructured as possible while at the same time covering the minimum range of information required. Any extra information acquired during the interviews was applicable to too few of the group concerned or was not classifiable and will remain as impressions, the effect of which will become evident in the discussion section. (Of course all information treatable appears in the results section).

Testing

The two cognitive (Concept Mastery Test and the Abstract Reasoning Test) were administered by the author, but the personality test (group form of the M.M.P.I.) was given to them to be done at home in order to make their task as light as possible.

Circulars

Thirdly, and finally, the secondary schools of these students were circularised to see if there were any items noted at school which might be used as prognostic indicators. The circulars were worded in such a way as to indicate that replies to at least three points would be desirable, while at the same time leaving sufficient latitude to mention other points of note that were not specifically requested. Of the more general comments perhaps a dozen were long enough to be of additional use but the points in common amongst the circulars were so few as to make it

impossible to cast them into a table or category that would be of any value.

The information obtained by these three procedures was itemised and tabulated to appear in its present form in the results section. In the matter of background items direct comparisons were to be made on each point between the two groups. This is true also of the circular obtained information. In the case of testing however, the significant sub-tests were to be extracted from the battery and treated as a unit by the most appropriate statistical technique.

Justifications

Criterion measures for superior students are difficult to formulate fairly but it is felt that any criterion arrived at should be as objective as possible, have the maximum degree of official recognition and preferably be interdepartmental. The criterion chosen satisfies these conditions.

In addition to this the criterion of an 'average' student is well nigh impossible to express satisfactorily. In accordance with accepted present practice it is held that a well chosen (i.e. entirely random) group will produce the least distort-results in the most economical manner (and thus satisfy the scientific requirement of parsimony). It is realised that a randomly chosen group may have a bias on a chance basis alone but it is believed that, for present purposes, the group is sufficiently large for error to cancel rather than accumulate.

The Concept Mastery test was included in this battery because Terman found it the most powerful discriminator in the testing field for cases of the intell-

ectually superior. It is indeed, a test of his own devising and in this study its efficacy appears to be demonstrated. Abstract reasoning was felt to be a strong factor in academic ability. The D.A.T. battery seemed to have the best test of this and so this D.A.T. sub-test was included. Seemingly there is a reasonably wide agreement that intellectual ability is a necessary, but not sufficient, condition for university success and so to throw as wide a net as possible a personality test was included. For purposes of this study the M.M.P.I. seemed to be the most useful. The test appears in group form and is thus easier to administer, it includes the largest number of questions of this type of test, it contains a consistency and lie check and it produces quantitative results which make it amenable to statistical procedures. The procedure in this case was discriminatory analysis (in which the significant and near significant sub-tests were included.)

Background data was treated mainly by the Chi Squared technique. Part of the reason for this was because it seemed the most appropriate method of treatment and partly because, being a non-parametric statistic it contains fewest assumptions concerning the raw data and is, on that account, less likely to determine unwarranted conclusions (Siegel (26))

Subtest means were compared and subjected to the 'Student's t test', significant and very nearly significant subtests being extracted from the battery and subjected to a discriminatory analysis. The value of this method of treatment is that it combines sets of scores and the discrimination is based on the set rather than the individual pieces. Two additional factors are gained from its use.

One is that it assigns weights to groups and thus maximises differences where they exist; secondly these weights may be used on unknown cases to determine to which of the groups the case belongs. (Moroney (20))

5 RESULTS

Three main groups comprise this section. Background, school circulars and tests. The first of these items, background, is divided roughly into the sections of

(a) actual constitution of the group
(b) family background
(c) school background
(d) some personal and university oriented items.

The Chi Squared formula used in the four-cell cases is that recommended by Siegel ((26) p 107)

Constitution of the Groups with Reference to Age (1.1)

Experimental		Control	
Age	Number	Age	Number
20	5	17	3
21	10	18	2
22	1	19	4
		20	2
N = 16		21	5
		22	1
		23	1
		26	1
		30	1
		N = 20	

Breakdown into Average Ages for the Two Groups (1.2)

Experimental		Control	
Both sexes	20.75 yrs	Both sexes	20.45 yrs
Males	20.80 yrs	Males	21.18 yrs
Females	20.66 yrs	Females	19.55 yrs

Treatment of the group in terms of numbers in each sex produces the following table.

Number of Males and Females in each Group (2.1)

Experimental	Control
10 males	11 males
6 females	9 females.

Calculated Chi squared not significant.

Constitution of Both Groups with Reference to Faculty and Sex (3.1)

Experimental				Control			
Science		Arts		Science		Arts	
M	F	M	F	M	F	M	F
8	2	2	4	4	1	7	8

With Reference to Faculty Only (3.2)

Experimental	Control
10 Science	5 Science
6 Arts	15 Arts

Calculated Chi Squared = 3.715 (Not Significant)

Having dealt with the constitution of the group we now consider family background.

Family Background of Both Groups (4.1)

Experimental	Control
Average number of children per family = 3.19	Average number of children per family = 3.35
Average position in family for subject = 1.87	Average position in family for subject = 1.65
7 eldest children	9 eldest children
2 only children	3 only children

FATHER'S BACKGROUND of BOTH GROUPS (5.1)

	Exper.	Control
University grads.	3	3
Some university	2	1
Univ. Entrance	1	0
School cert.	1	2
High School	5	5
Professional quals.	0	2
Primary only	4	7
Professional men	4	5
Business men	1	3
Interested in music	3	3
Interes. in intellec. pursuits	12	8
Church work (lay)	4	1
Still alive	14	16

The above data was treated by the Chi Squared technique for which it was cast into the form shown in (5.2).

(5.2)

	Exper.	Control
University	5	4
U.E.: S.C.: H.S.: Prof.	7	9
Primary	4	7
Profes. or business	5	8
Intellec or music interes.	13	8
Still alive	14	16

Calculated Chi Squared (Not Significant)

If, however, we extract one part of the table thought to be significant we produce the following table.

(5.3)

	Experimental	Control
Interested in Intell. Pursuits	12	8
Not Interested in " "	4	12

Calculated Chi Squared Not Significant.

Next follows a summary list of paternal occupations and hobbies.

Occupations and Hobbies of Fathers of Experimental Group (6.1)

1. Freezing Worker . . Politics, Music
2. Bank Officer . . . Music, Penal Reform, Trains, Education, Gardening, Church
3. Telephone Engineer Garden, Bowls, Masons, Committees
4. Clergyman . . . . . Bridge, Golf, Crosswords, Reading
5. Clergyman . . . . . Fishing, Cricket
6. School Principal . Church, Maths, Music, Chess, Railways
7. Bank Teller . . . . Garden, Stamps, Reading, Drama
8. Garage Propr. . . . Reading, Golf, Photo, Tennis, Swimming
9. Organ Builder . . . Bowls, Church
10. School Teacher . . Educational Work, Reading
11. Joiner . . . . . Bowls, Hunting
12. Carpenter . . . . . Theosophy, Freemasonry
13. Bldg. Foreman . . . Golf
14. Journalist . . . . Golf, Gardening
15. Engineer . . . . . Music, Rugby
16. Engine Driver . . . Theology, Church work.

Occupations & Hobbies of the Control Group Student's Fathers (6.2)

1.	Driver	Prac. mechanics, Educ. Gardening, Reading
2.	Marine Engnr. . .	Ships
3.	Salesman	Sport
4.	School head . . .	Woodwork, Singing
5.	Insurance Rep. . .	Music
6.	Naval Officer . .	Farming, Committees
7.	Teacher	Philately
8.	Clerk	Bowls, Hunting, Sailing
9.	Bridgeman	Bowls, Harriers
10.	Exec. in Gov't. .	Sport, Current affairs, Gardening
11.	Accountant	Rugby, League Sec'y, Vestry, Sport
12.	Bldg. Contractor .	Mountaineering, Soccer
13.	Taxi Prop'r . . .	Car mechanics, Golf
14.	Mech. Engineer . .	Pipe band, Bowls, Radio, Handyman
15.	Woolbuyer	Golf, Carpentry
16.	Locksmith	Animals, Gardening, Handyman
17.	Farmer	Reading, Fishing, Walking, Swimming
18.	Fish merchant . .	Home, Garden.
19.	Wharfy	Sport
20.	Brdg. house owner	Reading, Business.

Background Data for Mothers of Both Groups (7.1)

	Experimental	Control
University Grads	2	2
Some Univ.	2	0
Univ. Entrance	2	2
School Cert.	2	2
High school (no certs)	4	7
Primary School only	4	6
Teacher's Coll. (incl.prev)	3	3
Rural	2	7
Urban	13	11
Domestic as hobby	3	12
Interest in intellec.pursuits	9	7
Still Alive	14	20

To make the above data amenable to the Chi Squared technique it was compressed into table 7.2.

Background Data for Mothers of Both Groups (7.2)

	Experimental	Control
University	4	2
H/S:S/C:U/E:T/Coll.	11	14
Primary	4	6
Rural	2	7
Urban	13	11
Domestic	3	12
Intellectual	9	7
Still Alive	14	20

Calculated Chi Squared not significant.

Extracting from table 7.2 the numbers for intellectual interest we produce table 7.3 which is significant.

Domestic or Intellectual Interests of Mothers: Both Groups

	Experimental	Control
Domestic	3	12
Intellectual	9	7

Calculated Chi Squared = 5.95 (Significant at the .05)

The final data on Mothers is presented in table 7.4, indicating their hobbies.

Hobbies of Mothers; Both Groups (7.4)

Experimental	Control
Politics, Music	Domestic
Knitting, Reading	Domestic
Garden, Church organist	Domestic
Bridge, Golf, Reading	Garden
Hockey, Maths, Tramping	Reading
Domestic, Dressmaking, Drama	Domestic
Everything. (sic)	Reading, Domestic
Domestic	Domestic
Bowls, Church	Domestic
Garden	Reading
Committees, Church, Singing	Church, Garden
Dressmaking, Handiwork	Reading, Domestic
Drama Group, Reading	Golf, Dressmaking
Golf, Gardening	Dancing, Social, Ballet, Church
Music	Domestic, Reading, P.T.A.
	Literature, Music
	Domestic
	Domestic
	Sport, Domestic
	Business.

Data on pastimes is presented in table 8.1, following

Clubs and Activities Joined; Both Groups (8.1)

	Experimental	Control
Number of students with no pastimes	2	5
Average number of activities joined	3.06	1.4
Average number of sporting activities	.94	.5

Turning now to school background we start with amount of reading done.

Amount of Outside Reading Done During Primary School Days (9.1)

	Experimental	Control
Read more than age mates	15	16
Read about aver. amount	0	3
Read less than age mates	1	1

To cover a non-literary aspect numerical practice is considered in table 10.1.

Extra Practice with Numbers During Primary School Days (10.1)

	Experimental	Control
Maximum Experience	1	0
Lots of Experience	2	0
Some Experience	6	2
Little Experience	2	1
No Extra Experience	5	17

Cast into the following table for Chi Squared purposes (10.2)

	Experimental	Control
At least some experience	9	2
Little or no experience	7	18

Calculated Chi Squared = 6.91 (Significant at the .01)

Tables 11.1 to 11.3 cover a range of data on schooling.

School Background of Both Groups (11.1)

	Experimental	Control
Attended kindergarten	7	8
Age started school (less than 5)	4	0
(at 5)	8	19
(more than 5)	4	1

Subjects liked at school:-

English	5	13
Latin	4	3
French	2	7
Chemistry	3	7
Biology	1	5
"Science"	5	2

Class Positions at School: Both Groups (11.2)

	Experimental	Control
Primary School:-		
Top	6	5
Top 5	5	7
Top 10	4	5
Middle	1	0
Secondary School:-		
Top	5	2
Top 5	5	6
Top 10	2	5
Middle	1	1

(N.B. Top five means position 2nd-5th: Top ten means position 6th-10th)

(11.3)		Experimental	Control
Aver. No. of primary schools attended		2.33	1.80
Modal. No. of secondary schools attended		1	1
Type of U.E.:-	Accredited	12	16
	Examination	3	2
	Univ.Schol'ship	1	1
	Ad Eundum	0	1
Aver. age for U.E.		16.06 yrs	16.52 yrs.
Upper Sixth Form:-			
Number with two years		2 } 15	1 } 12
Number with one year		13 }	11 }
Number with no years		1	7

Calculated Chi Squared not significant.

The data in Table 12.1 was obtained from those students who received vocational guidance.

Student's Treatment of Vocational Guidance Advice (12.1)

	Experimental	Control
Advice ignored	3	3
Advice non-directive	1	1
Advice confirmatory only	1	1
Advice taken	1	2

Next follow some items of more direct relevance to university work.

Constitution of the Groups in Terms of Part/Full Time Study (13.1)

Experimental		Control	
Full Time	Part Time	Full Time	Part Time
14	2	11	9

Calculated Chi Squared = 6.09 (Significant at the .05)

In table 14.1 the bursaries may be seen to cover a fairly wide range.

Bursaries Held by Both Groups (14.1)

	Experimental	Control
Senior National	3	0
Higher School Cert.	8	6
Teacher's Studentship	3	2
Junior Scholar	1	0
Ordinary National	1	4
Fees only by Teacher's Coll.	0	4
Maori Scholarship	0	1
No Bursary	0	3

The following table 15.1 is of demonstrable relevance to academic superiority.

Average Age at which First Library Ticket Obtained. (15.1)

Experimental	Control
8.13 years	11.30 years

Using "Student's" t this is significant at the .01 level.

Work schedule and loads are shown in the following tables.

Amount of Work Attempted and Hours Study per Week (16.1)

	Experimental	Control
Av.number of units attempted	(full)	2.4
Aver. hours study per week	42.0	29.12

Amount of Organising Done (16.2)

	Experimental	Control
None	0	5
Little	6	3
S ome	8	7
Lots	2	4
	(N = 15)	(N = 19)

Table 17.1 shows the present career intentions of the two groups, although the ideas are held with varying degrees of firmness.

Career Intentions of the Groups (17.1)

	Experimental	Control
University	2	0
Univ. or Research	3	0
Univ. or Library	0	1
Research	4	1
Library	1	2
School Teaching	2	13
Clergy	1	0
Geology	0	1
Don't Know	3	2

Tables 18.1 to 20.1 indicate some personal items.

Manner of Travel to and from University (18.1)

	Experimental	Control
Bicycle	14	15
Walking	1	1
Car	1	4
Average travelling time to univ.	10 mins	10 mins

Health : Both Groups (19.1)

	Experimental	Control
No. had serious illnesses	6	10
No. had serious accidents	4	2
No. who wear spectacles	1	4
No. with recurring troubles	4	6
No. with asthma, migraine or hay fever	2	5

Reason for Starting a Degree (20.1)

	Experimental	Control
Utility	6	10
Interest	4	8
Equally utility or interest	6	2

It should be noted that the following table on comments applies only to the control group N = 19.

Comments on the University: Control Group Only (21.1)

		Number
Best mode of expression for exams;		
	Writing	11
	Speaking	5
	Equal pref.	3
Type of Exam preferred:		
	Writtens	11
	Orals	4
	Equal pref.	4
Comments in General:		
	Want more space	1
	Want more tutoring	6
	Want better facilities	2
	Want exams spread thru. the year	1
	Want reduction in Stud. Assn. fee for p/timers	1
	No improvement needed	5
	No comment or don't know	3

Finally table 22.1 - 22.2 deals with the number of close friends.

Number of Close Friends: Both Groups (22.1)

	Experimental	Control
None	2	5
One	0	5
Two or three	1	3
More than three	13	7

To make the data amenable to chi squared it was recast to form the following -

Number of Close Friends (22.2)

	Experimental	Control
Three or less than three	3	13
More than three	13	7

Calculated Chi Squared for this is 9.69: Signif. at .01

Responses to Circulars from Schools

The number of circulars returned from schools and the treatable data contained therein appears in the following table.

	Experimental	Control
No. of circulars sent	16	18
No. of circs. returned	14	14
No. of successes predicted	14	6
(Calculated Chi Squared signif. at .01 (8.57)		
Outstanding pupils at school	11	6
(Calculated Chi Squared Not signif.		
Those solitary or retiring	6	1
(Calculated Chi Squared Not signif.		

Testing

Both groups were given a battery of tests covering both cognitive and personality aspects. The tests in the battery were :-

The Concept Mastery Test
The Abstract Reasoning Test
M.M.P.I. (Group form)

Thirteen sub-tests were gained from the above battery. They were:-

Concept Mastery Test part 1	1 part
Concept Mastery Test part 2	1 part
Abstract Reasoning Test	1 part
M.M.P.I.	10 parts
	13 parts

For each of these tests the experimental group means were compared with the control group means using 'Student's t test'. Three of these subtests proved to be significant and two others near significant

Subtest	Code	Significance
Concept Mastery Pt. 1	A	.01
Concept Mastery Pt. 2	B	.05
Abstract Reasoning	C	Not
Psychopathic Deviate	D	.05
Sociability	E	Not

(Subtests D & E are scales of the M.M.P.I.)

In subtests A, B and C the experimental group scored higher than the control group. The results of

subtest D indicate that the more successful student tends to have less of the psychopathic deviate in his psychological make-up than the 'average' student. Subtest E shows that the academically superior student is more sociable than his 'average' counterpart.

The five subtests were later subjected to a Discriminatory Analysis. (Data and calculations appear in appendix). From these calculations the five values obtained by simultaneous equation were:-

(a) = 0.0459
(b) = 0.0319
(c) = 0.0647
(d) = 0.3210
(e) = 0.0370

Using this data the Hotelling T squared was calculated at 25.101. This value was then converted to Snedecor's F ratio which was 4.37. With degrees of freedom five and twenty seven respectively the discriminatory function distinguishes between the two groups at the .01 level of confidence. Reference; Moroney (20)

6 INTERPRETATION OF THE RESULTS

It will be seen from the tables of results that although many correlates were tried only five background items were significant, excluding the school prediction and test results.

The purpose of this interpretation is to clarify and qualify all the correlates that were tried, not excluding the ones that were not significant.

Background Items

Age Tables 1.1 and 1.2 indicate that there is no appreciable difference tetween the ages of the experimental and control group students although the spread of ages for the control group tends to be greater. Nor, apparantly does the break-down into sex and age make any difference, but it will be seen that in the control group the females tend to be slightly younger than average and the males slightly older than average.

Sex The relative proportions of males and females in each group do not differ significantly as determined by a calculated chi squared. (table 2.1)

Faculty and Sex When these two categories are combined no significant difference is obtained, it is interesting however to note that the experimental arts when compared to control arts evidence a reversal of the number of males and females in each group respectively. It seemed as though faculty on its own would produce a significant difference so the table was recast in terms of faculty only and the result, although not significant, is quite close to it. The trend indicates that the more successful student tends to progress in science. (tables 3.1 and 3.2)

Family Background This data seems to contradict what seems to be a reasonably common finding in the U.S. In the U.S. some experimenters find that the brighter student tends to be a first or only child whereas in this study that finding is contradicted. The average number of children in the family for the two groups was 3.19 and 3.35 respectively. Position of the S. in relation to his or her siblings seems to make little or no difference either being, in this case, 1.87 and 1.65 for the two groups.

For the experimental group (n=16) there were seven eldest children and two only children. For the control group (n=20) there were nine eldest children and three only children which was not a significant difference. (table 4.1)

Father's Background The items tested for this are itemised in the tabular results and compression of the 5.1 table into the 5.2 table, to make it amenable to the chi squared technique, did not produce any significant difference. Abstraction of a portion of table 5.1 to make table 5.3 did not yield any significant differences either.

Mother's Background As in the case of father's background the items are itemised in tabular form in table 7.1 and this is compressed into table 7.2 for statistical purposes but in the overall result we are obliged to conclude that generally speaking there is no difference between the mothers of the two groups. However if we take one particular item from the table, that of mothers domestic or intellectual interests we find that a significant difference does exist. It appears that the mothers of the superior students tend to have intellectual interests in significantly greater numbers than do the mothers of the 'average' student. ($p=.05$)

Clubs and Activities Table 8.1 concerns the number of non paid extra curricular activities in which a student joins. This general idea of clubs, hobbies and sports might be subsumed under the rubric of 'pastimes'. Between the two groups no difference exists with respect to the number who join no pastimes but it is to be noted that the successful student tends to join about twice as many clubs as his 'average' colleague. Also that, bearing the previous point in mind, they join sporting clubs in about the same proportion. The interpretation of this is rendered rather more complicated by the fact that a

significant number of the control group students are part timers (see table (13.1). In view of how little time the part time student has it is, perhaps, remarkable that the part timer joins as many clubs as in fact he does.

Reading Habits During Primary School Days To get the S's to answer this it was indicated that it was sufficient to indicate whether they read appreciably more than their age mates, about the same, or appreciably less. From the table it may be seen that the spread of this three category table is about the same for both groups and that the student in general is distinguished by at least some degree of reading precocity. (table 9.1)

Number Practice During Primary School Days The question asked for this was roughly of the form of how much informal practice in counting, numbers and arithmetic was obtained at any stage during the primary school days. This to include such things as private coaching, flair for dealing with numbers, use of counting devices and the general experience of quantification, excluding the formal schooling. The five categories enumerated in table 10.1 was not amenable to statistical procedures so it was compressed into table 10.2 and with the dichotomy "at least some experience/little or no experience" it was found that the having had at least some experience was of significant interest.

School Background Both groups attended kindergarten in about the same proportions but with only one exception all of the control group students started at the age of five

whereas in the experimental group a quarter started earlier than five, half at five and the remaining quarter later than five. Perhaps the heterogeneity of the school starting age of the brighter students is an indicator of parental flexibility which may, in itself, be significant. With reference to the subjects liked at school it is interesting to note that about five eighths of the control group liked 'English' at school which fits in quite neatly with table 3.1 indicating a tendency for the control group student to prefer arts to science. The experimental group, on the other hand, seemed to spread their likes over a much wider range (table 11.1)

From inspection it may be seen that at primary school the two groups tended to be about the same position but at the secondary school a difference was becoming evident. The brighter group had ten in the top five (n=16) i.e. five eighths in the top ten whereas the control group had but eight in the top ten (n=20) i.e. two fifths.

Table 11.3 shows that the experimental group attended about half as many schools again as the control group students. It is possible that this greater number of primary schools attended is related to the spread in the starting age (see table 11.1) although the connection is difficult to see at this juncture without more adequate background knowledge.

There was scarcely any deviation in the number of secondary schools attended and that is why the modal number is quoted rather than the mean.

Inspection shows that the most common form of university entrance was by accrediting but a greater proportion of brighter students entered by examination U.E. which is

oddly at variance with Parkyn's findings that the better student tends to be accredited. Perhaps this can be accounted for by the conservatism of the schools who hesitate to accredit in doubtful cases, for it will be noticed that the experimental group got U.E. six months younger (on the average) than the control group.
For both groups the majority spent one year in the upper sixth form but in the experimental group only one in sixteen had no time at all in the upper sixth form whereas in the control group seven out of nineteen had no time in the upper sixth form.
The calculated chi squared for this table of attendance at upper sixth yields a value which is not significant.

Vocational Advice In this the treatment of the vocational advice given does not speak very highly of the student's opinion of the advice that they had been given. For the purposes of this table the definition of vocational advice is that advice given in an individual interview by either an education dept. V.G. officer or by the school careers master. The two middle categories are really not applicable since they are, in a sense, too indefinite to be taken under the definite title of advice. It will be noted however that the two groups together took the advice in three cases and rejected it in six cases. The two groups doing it in approximately the same proportions.
It would be of greater help in interpreting this table if we knew the way the public at large treat vocational advice and the proportion that accept and reject it. It does, perhaps, in this case, indicate a tendency for the student to rely on extra-official sources, or perhaps on himself

for his ideas on what he would like to do; it is still curious however that they should seek such advice since it is in no way compulsory. It may, of course, be merely a starting point for a more complete enquiry and if this is the case then it might be said to fulfill a legitimate function. (table 12.1)

Part/Full Time Study It may be observed from table 13.1 that a significant number of the experimental group students are full time, where about half of the control group students are part timers. Perhaps one of the most difficult criteria of all is the definition of what a part timer is; for the purposes of this investigation an arbitrary point was chosen and the part timer defined as a person who has a paid position involving more than ten hours work per week. The students labelled so in this study were labelled on what they were at the time of being interviewed and it is known that several contemplated changing within the near future but it was thought better to take an unprejudiced cross sectional slice. Also there were some part timers who had jobs of slightly over ten hours per week but which interfered very little with their study; again it was thought better to remain within the limits which have been pre-established rather than attempt to assess what they thought was 'interference'. In addition to this it is believed that many of the errors which might occur would cancel since the groups seem large enough to warrant such a conclusion.

Bursaries Perhaps the most notable feature of table 14.1 is that of the students with no bursary. All of the ex-

perimental group had bursaries whereas only seventeen of the twenty control group students had bursaries. Two of the twenty control group students reported that they experienced economic pressure and neither had a bursary. No experimental group student reported economic pressure. Certainly those who experience financial difficulties are fewer in number than was expected but the two who did were in genuine need of assistance. In addition both of the poor (financially) students got little or no encouragement from home. To be poor is a difficult thing to define so it was thought better to take the student's own assessment of whether they were poor or not since their own perception of their financial state is more likely to affect their behaviour than the amount that they have in the bank.

Library Ticket This table (15.1) yields a significant result. Some of the S's were able to remember quite accurately the age at which they obtained their first library ticket, others could only approximate. In the latter case the average was taken, e.g. 'between eight and ten' was taken to be 'nine'. "Student's" t was calculated for the difference between means for the two groups and the result found to be significant at the .01. Obviously the ticket itself is not the point but rather that the precocity in getting a ticket is an indicator of some other factor; perhaps intellectual precocity, perhaps this allied to an overweening curiosity. Whatever its cause the item is sufficiently significant to warrant further investigation.

Studying Table 16.1 is in three parts; firstly the average number of units attempted. The experimental group all attempted a full years work e.g. four papers for a master's degree or three B.Sc.(hons) full units, where the control group attempted an average of 2.4 units. As one would expect this is lower than that of the experimental group since it includes a significant proportion part timers (see table 13.1). Secondly it will be seen that average number of hours study per week, although having a large deviation, is about proportional to the amount of work attempted. This suggests that the absolute number of hours work spent in studying is not a crucial factor in academic success (provided that one has done the irreducible minimum).

Career Intentions In this the experimental are far more undecided on a specific occupation than are the control group but the preference of the experimental group is for the sort of university/research kind of job. The dominant majority of the control group, however, intend to be school teachers. (Thirteen out of twenty). Presumably the 'average' graduate has a better chance of a job at school teaching than at anything else. It seems reasonably certain that post primary teaching is the biggest single recruiter of university graduates in New Zealand. It is also "normative" for the majority of graduates to enter teaching in New Zealand.

Manner of Travel to and from University It may seem from table 18.1 that about the same amount of time is spent in travelling to and from the university, or alternatively that both groups live about equal distances from the

university (on the average). Slightly more of the control group have a car to travel to lectures but this is not a significant increase.

Health Considering the relative number of S's in each group the figures obtained do not differ from what one would expect with the exception of the second one. In the experimental group four of the sixteen (one quarter) have had serious accidents (e.g. falling off a horse and breaking a major bone) whereas only two of the twenty in the control group have had serious accidents. This might be taken as an indicator that the experimental group as a whole are more likely to try something with a possible view to success even though it entails something unpleasant. One might of course argue as cogently that the experimental group are clumsier, but this finding is not consistent with the present writers opinion of them. (table 19.1)

Reason for Starting a Degree The only curious point about this table is that six of the sixteen experimental group students started a degree equally for interest and utility whereas only two of the twenty control group students did so. It might indicate a greater degree of honesty on the part of the experimental group but half of the control group stated 'utility' as being the reason for their starting a degree. This is presumed to be the least 'desirable' answer. The difference is difficult to account for but is not significant statistically.

Comments on the University

By some freak of co-incidence the answers to this by the experimental group were too few in number to be usable. At least it is presumed to be coincidence. This lack was not noticed until all the interviewing had been completed; to offset any practice effect the groups were interviewed in mixed order, i.e. persons were interviewed in random order regardless of the group to which they belonged. Scrutiny of the data sheets showed that in about a third of the cases the fault rested largely with the present writer for either failing to ask the question or failure to record it adequately. It is also true that this third were, in the main, among the first interviewed and so some practice effect may have crept in inadvertently. The remainder, however, were questioned on the matter but the replies were either a non-committal shrug or too discursive to be classifiable. Although it is impossible to isolate the reason with any degree of certainty it is felt that it is a fortuitous incident and not of any diagnostic significance.

It will be noted in the first two parts of this table that slightly more than half prefer the present arrangement of written exams and this result is consistent with their preference for writing or speaking as modes of expression.

The comments in general were much as expected and showed a reasonably wide range. In numerical terms the thing most wanted is more tutoring. Upon being questioned further on this, it was made clear that the students did not want more 'mothering' of the high school sort but rather a move toward the 'Oxbridge' system of smaller and more frequent tutorials was thought desirable. As well as the

extra knowledge gained from this it would also be a help in terms of reduction of the examination stress. The tutor would have a reasonable idea of the student's ability and the amount of work done over a given period and this could be utilised to reduce the emphasis placed upon the end of year examination. The only surprising item was the relatively high number who thought that no improvement was needed. This might give the impression that they thought things quite adequate but many commented that they had no standard of comparison since they had been to no other university.

Number of Close Friends This table (22.1) was recast (into table 22.2) to make it amenable to the Chi Squared technique. The result was a significant one and indicates that the successful student tends to have more than three close friends whereas the 'average' student tends to have three or less. It is to be noted that it does not purport to say anything about the range of their more casual acquaintances. Perhaps this table might be interpreted to mean that the experimental student is more independent with reference to attachment to a single person. If this is an indicator of self sufficiency in the more able student it would be consonant with the present writer's expectation, based upon an impression gained from the respective groups while interviewing them. Certainly some of the control group students were very self sufficient but that group also included some who were rather the reverse. In this connection the experimental group appeared to be much more homogeneous than the control

group. This may be explained by the knowledge that self sufficiency roughly corresponded to age and the experimental group ages showed a much smaller range.

Circulars to Schools

Circulars were sent to the post-primary schools of all of the successful students and to eighteen of the twenty 'average' students. In the latter case two were omitted, one because he went to school abroad and the other because he had left school so far back that all the staff had been changed.

For each group fourteen circulars were returned which seems to be sufficient to warrant drawing some conclusions. In the case of the experimental group fourteen out of fourteen were thought to be likely to succeed at university whereas in the control group six out of fourteen were thought to be likely successes at university. This difference in school prediction is significant at the .01 level.

Eleven of the fourteen experimental group students were reported as being outstanding students at their post-primary school where in the control group only six were reported as being outstanding. This difference is not significant.

Those students of a solitary or retiring nature numbered six in the case of the experimental group and only one in the case of the control group. It is to be noted that this ill accords with the finding of the M.M.P.I. The level of significance of this sub test is fairly low (.05) and if the present writer were to choose it would be in favour of the school observation, as thought to be less likely in error because it is based upon more consistent observation over a period of time and the observations were actual whereas in the case of the M.M.P.I. falsification is relatively easier. This presumes of course that they have not changed their character between school and

university; although this is not impossible it is thought improbable since we are dealing with actuarial conditions.

Testing

The significant subtests seem to require some comment. Firstly the Concept Mastery; this was devised by Terman for his longitudinal study of gifted children, and worked well. It does work well perhaps because the test covers such a wide range of things. For instance it includes questions from almost every field, there are problems that require some intellectual precocity to solve, the familiarity with words and their meanings and nuances is thought also to characterise precocity, and finally the recognition of major points and the ability to remember and relate them is of importance. It is believed that for these reasons it is a good discriminator.

Apart from the two halves of the Concept Mastery Test the only other subtest that was statistically significant was the psychopathic deviate scale of the M.M.P.I. The superior student tends to have less of the psychopathic deviate in his makeup than the 'average' student. This finding is consistent with Terman's finding that the more intellectually able tend also to have better physical and psychological health than the average. This seems a not unreasonable conclusion to make; that those who are most closely in touch with their environment are most likely to make a success of it. (It might also be pointed out that one can be too closely in touch with it, e.g. where one responds to every petty stimulus and maintains too little psychological continuity. This does not seem to be true of the superior students).

Abstract Reasoning, as tested by the D.A.T. subtest although not significant was close to it. Perhaps necessary but not sufficient?

The sociability scale of the M.M.P.I. again,

though not significant was close to it. In this case the academically superior student was more sociable than his 'average' counterpart. One other result of this study that is inconsistent with this finding is that the school circulars reported six of the fourteen experimental students were shy or retiring whereas only one of the control were reported as shy or retiring. It is to be noted that neither of these results are statistically significant (at the .05 level or better). In the matter of sociability only one result is significant and that is on the number of close friends. The successful student has more than three close friends whereas the 'average' student has three or less. It seems that there is a slight lacuna between close friends and general sociability and it is doubtful if any value would result from such a forced connection. Perhaps subsequent studies will clarify this point.

7 DISCUSSION

In all, thirty eight factors were tested for significance to determine whether, on the basis of any of these factors, academically superior students could be distinguished from students of average ability. Of these thirty eight factors, nine proved to be significant. Five of them were background items, one was gleaned from the school circular and the other three were subtests of the standardised battery.

Background

Of all the significant factors, that the superior student tends to be full time seems the most obvious. The full time student has less competition of interests, is able to work during the day when he is fresher instead of being obliged to start after a day's work. He recieves both stimulation and practice from a wider contact with his fellow students, and his study is often geared to his obtaining employment when he has finished his degree.

In all fairness to the opposite point of view, it should be pointed out that one would expect there to be less financial pressure on the part timer. This argument may be refuted by citing the evidence in this study that financial difficulties are not an item of significant differentiation between the two groups. It should also be remembered that in New Zealand to be a part time student is by no means to be abnormal, and that part time students form a significant part of the student population.

The importance of the Jesuitical 'seven years' has received recent confirmation from Hebb. He stresses the importance of early learning; or more generally that there are specific ages for perfecting certain things. The person who has, perhaps, the greatest influence during a child's formative years is his (or her) mother. It is, therefore, with little surprise that a significant item is that the mothers of the superior students tend, in significant numbers, to have intellectual (as opposed to domestic) pursuits and interests.

Consonant with this finding on the earlier intellectual influences we also note that the academically superior students obtained their first library ticket at a significantly younger age than their average counterparts. It seems rather improbable that we could make any appreciable difference to academic ability by getting all children to join the library three years sooner. Such a thing is not impossible but is thought to be rather improbable. A more likely explanation is that this factor is an indicator of a more fundamental one allied, perhaps, to intellectual precocity, extra curiosity, or academic drive.

As a continuation of these significant cognitive factors we again note that extra practice or tuition in counting and numbers was found, in this study, to be a significant differentiator of the two groups. Such practice would lead to better all round development and prevent the relatively common numerical myopia which gives so many students so much trouble. It could also be taken as an indicator of better all round development. In table 3.1 we note that one tends to have a better chance of being a successful student if one is a male doing a science degree. The connection between science and maths is too obvious to need any labouring here, but clearly the significance of numerical practice has more contributing to it than the fact of being a male science student. The point is mentioned for the benefit of future investigators.

These latter three items seem to connect with something suggestive of precocious intellectual development; the first item, that of being a full time student, appears to help bring to fruition these qualities, whatever they may be.

The fifth significant background item appears to be a non-cognitive one. This item is that the superior student tends to have more than three close friends (or may we interpret this to mean no close friends). This item is very difficult to account for but perhaps it might mean that the successful student acquires more friends by virtue of his better social adjustment. It is also noted that there is a tendency (although not a significant one) for the successful student to score higher on the sociability scale of the M.M.P.I. This is interpreted to mean that the successful student is more sociable than his average counterpart.

School Circulars

Of the data obtained from the school circulars only one of the items was significant; that of prediction of success at university. It may be pointed out that almost the entire staff of the post primary teacher's body are themselves university graduates and should, in consequence, have a reasonable idea of whether any particular pupil has a chance of success. We may, it seems, have more confidence in teacher's assessment than is generally allowed. At school the teachers may base their assessment and opinion upon a fairly extensive knowledge of the pupil in both intellectual and non-intellectual factors. Although this item of significance was not predicted it appears readily comprehensible.

Tests

A battery of tests was selected to cover two aspects of the subjects; cognitive and personality. The cognitive tests were the Concept Mastery Test and the Abstract Reasoning test of the D.A.T. battery. Terman devised the first mentioned on the presumption that mental forwardness is characterised by high conceptual ability and Terman used the test with some success. The results of this study demonstrate its efficacy. Very closely allied to this conceptualising factor seems to be the ability to reason abstractly. Although the latter seems not as important as the former it is so near significant as to become so when included in the discriminate function. Together these tests comprise the cognitive part of the battery.

The non-intellective aspects were tested by use of the M.M.P.I. Only on two of the scales were the groups sufficiently differentiated to warrant our drawing any conclusions here. It appears that the superior student has

less of the psychopathic deviate in his character than his average counterpart. It is difficult to determine whether this precedes or follows academic superiority but it is an interesting correlate and seems to fit in well with the superior student's greater sociability in that better adjustment would be expected to lead to a greater number of friendships. Greater sociability (as measured by the M.M.P.I.) also fits in with the item that the academically able have more than three close friends. Perhaps, also, the superior student is sufficiently independent psychologically as not to feel the need of one particular friendship, but rather is able to form friends more readily with a greater number of people.

The Average Student

The average student probably comes from a family of three children in which he is either the first or second child. The father of the family may be of almost any occupation or profession, and in all probability the mother will have the house and family as her interests which are very likely to be only domestic. Education of the parents may have been to any stage ranging from a degree to never having been to high school but there is a moderate probability that they had either school certificate, university entrance or went to teachers training college.

In the matter of university work the average student is almost as likely to be a part timer as a full timer and the chances are three in four that he has an outside past-time as well, perhaps even two. If ever the student had vocational guidance advice he is as likely, if not more, to have rejected it as anything else.

The bursary held by the student may be one of a

wide variety but rather more probable is that it is either a higher school certificate bursary or an ordinary national bursary.

In the matter of health the average student may be said to be fairly well off. Very likely he has had no serious illnesses but may have a little recurring trouble such as a tendency to sprain a wrist or susceptible to ordinary colds. There is a strong probability that he will travel by bicycle.

His degree may have been started from either interest or utility but slightly more probably from utility because it is more than likely that he intends to be a post primary school teacher. The odds are about two to one that he prefers writing to speaking as a mode of expression and if he has a complaint against the university it is most likely to be that more tuition would be desirable.

The Superior Student

It may be fairly presumed that in respect of the non significant variables tried here the two groups are homogeneous with reference to background. For the points in which they differ we may need to draw a slightly different picture.

The family background seems to be about the same as the general student population but differs in that the superior student's mother probably had an interest in intellectual pursuits of some sort and may well have been of urban background.

Early development was probably characterised by the first library ticket being obtained at the age of eight years whereas the student-in-general got his at the age of

eleven. This early interest in the realm of the non-material was evidenced by his having extra practice or tuition in numbers or counting. All students, it seems, do more outside reading during their primary school days than do their peers.

Curiously the superior student is as likely to have started school before or after the age of five as he is likely to have started at the age of five. (Where, with one exception of a foreign born person, all the average students started at the age of five).

In all probability the academically superior student was accredited university entrance and spent at least one year in the upper sixth form. The average age for getting university entrance was six months lower for the superior student, being sixteen instead of sixteen and a half.

If the student had vocational guidance advice he is as likely to have ignored it as anything else.

Again the degree was as likely to have been started for interest or utility but the career intention is much more likely to be university or research work than anything else. It is almost certain that the superior student will be a full time student and carry the full academic load. In addition to this he will join twice as many clubs as the average student. (Perhaps we might characterise this as an index of intellectual activity). His health, on the whole, seems good and very likely he travels everywhere by bicycle. With respect to age the superior student tends to be more homogeneous.

It appears that the superior student is more gregarious than the general student population and is significantly less of a psychopathic deviate. He is also

characterised by superior conceptual ability.

In the opinion of his post primary school he is more than likely to succeed in gaining a degree.

A Few General Considerations.

To the present writer it seems that the use of the term genius adds nothing to our understanding. It recurs in the literature but seems to carry a different meaning to each author. To one it means fame, to another talent, to a third it is defined in terms of test scores. It might be more desirable to keep our terms as operational as possible.

For the benefit of future investigators it is pointed out that in the matter of background items, with two exceptions, the significances are all high, being .01 or better. It suggests a constellation of significant items in the background of academically superior students, some of which items are shown here. Future researchers may care to complete the constellation.

One point, it is felt, should be made explicit; the present criterion of a successful student is someone who successfully competes in the present system.

With reference to other important studies in the present field of interest the only point of definite contradiction is that on position in the family. In the review of literature it may be noticed that at least four studies have evidence on this, there being two for each point of view. (That it is either significant, or not significant). Some studies find that the academically able tend to be first or only children while others show that it is not a significant item. It seems not unreasonable to suppose that there is a good deal of cultural

influence in the matter and none of the references are to a New Zealand population. It is also suggested that the present finding in this study is not incompatible with the New Zealand culture. Further evidence is required to extend the point on a more general basis.

8 SUMMARY AND CONCLUSIONS

The present study was an attempt to distinguish the academically able student from the average student. Two groups were chosen to represent the above categories and they were subjected to a testing program and interviewing sessions. In all, twenty two background items were sought, their high schools were circularised for information and they were subjected to three psychological tests, which tests yielded thirteen subtests.

Of all this information seven items proved to be significant. Five of them were background items, one was school prediction of university success and the seventh was the significant and near significant test results used in a discriminatory analysis.

The conclusions are set out overleaf.

1. A significant number of experimental group mothers were interested in intellectual pursuits.

2. Experimental group students had their first library ticket at a significantly younger age than the average student.

3. Extra practice or tuition in numbers and arithmetic during primary school days is significant in the background of the experimental student.

4. To have more than three close friends is significantly typical of the experimental group student.

5. A significant number of the experimental group were full time students.

6. School prediction of success was significantly greater for the experimental group.

7. Used together as a discriminatory function the following sub-test scores were significant

Concept Mastery Test Part 1 . . . .Exper.group scored more
Concept Mastery Test Part 2 . . . .Exper.group scored more
Abstract Reasoning Test . . . . . .Exper.group scored more
Psychopathic Deviate Scale . . . .Exper.groups " less
Sociability Scale . . . . . .Exper.groups " more

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APPENDIX

Appendix A Raw Test Data

Subtest A.....Concept Mastery Test Part 1

Subtest B.....Concept Mastery Test Part 2

Subtest C.....Abstract Reasoning Test

Subtest D.....Psychopathic Deviate Scale (M.M.P.I.)

Subtest E.....Sociability Scale (M.M.P.I.)

Experimental					Control				
A	B	C	D	E	A	B	C	D	E
97	57	53	10	28	36	15	39	12	53
90	52	53	9	34	103	66	50	5	24
85	47	35	10	35	67	31	44	24	30
67	45	56	4	20	23	25	48	10	18
95	50	52	13	25	29	26	53	11	23
90	48	51	8	44	99	45	45	10	31
73	39	48	8	47	22	22	49	15	27
72	33	50	12	45	35	28	36	14	34
57	44	53	11	28	32	29	44	17	39
106	53	50	12	25	25	19	44	14	14
93	52	45	7	44	51	35	43	11	6
68	44	47	8	43	49	50	54	12	43
63	43	43	14	38	16	11	41	15	34
39	33	53	18	49	44	33	46	13	16
					52	43	51	13	26
					61	51	1	11	20
					102	48	48	12	48
					33	43	43	14	21
					83	58	50	15	38

N.B. A constant of 9 has been added to subtest C in order to keep all the values positive.

Appendix B Discriminate Function Calculations

Means	A1 78.21	B1 45.71	C1 49.21	D1 10.28	E1 36.07
	A2 50.63	B2 35.68	C2 43.63	D2 13.05	E2 28.68
	D 27.68	D 10.03	D 5.58	D 2.77	D 7.39

(top line is the data for the experimental group)

Sums of Squares

Exper.	Control
A 90109	A 62924
B 29924	B 28240
C 34289	C 38481
D 1636	D 3486
E 19399	E 18263

Cross Products

Exper.	Control
AB 51462	AB 40405
AC 53750	AC 42141
AD 10979	AD 12047
AE 38664	AE 28898
BC 31500	BC 29521
BD 6462	BD 8468
BE 22577	BE 19506
CD 7079	CD 10826
CE 24647	CE 24107
DE 5283	DE 7257

Within Set Corrected Sums of Squares

Sigma (Sum of)	A squared	.. 18682
"	B "	.. 4713
"	C "	.. 2691
"	D "	.. 404
"	E "	.. 3813

Within Set Sums of Products

AB..7482
AC.. 29
AD..-792
AE.. 470
BC..- 58
BD..-502
BE..-450
CD..- 1
CE.. 122
DE.. 232